

FISHERIES RESEARCH BOARD OF CANADA

Atlantic Biological Station

St. Andrews, N. B.

A. W. H. NEEDLER, Director



3 1761 11682892 2

Gov. Doc  
can  
SH  
37  
A345  
no. 10  
Biological  
& Medical  
Serials

General Series, No. 10

CIRCULAR

July, 1947

## Irish Moss Industry in the Maritime Provinces

A. W. H. Needler

Irish or Carrageen "moss" (scientific name **Chondrus crispus**) is a small seaweed which is abundant on parts of the Canadian Atlantic coast. It is used commercially for many purposes. Before the war North American users got most of their supplies from Europe and some from Massachusetts. When European supplies were cut off and at the same time its use on this continent increased, supplies were sought elsewhere in New England and in the Maritime provinces. An industry was created which benefits many of our shore communities. In order to maintain it we must learn to produce moss of the very best quality as efficiently as possible. Irish moss is again available from Europe in quantities difficult to predict and the mucilaginous material or "gelose" from Irish moss must again compete with others which were unusually scarce during the war. We must learn the best methods of collecting the moss and preparing it in the way the market wants it.

This circular summarizes our present knowledge as it affects the industry in the Maritime provinces. The Fisheries Research Board and other research agencies are co-operating with the industry in developing improvements in the production and preliminary curing of Irish moss to meet the industry's needs. This circular will leave many questions unanswered and will require revision from time to time. Meanwhile, those interested in this industry should not hesitate to address inquiries to the Atlantic Biological Station, St. Andrews, N. B.

### How to recognize Irish moss

It is a small seaweed which grows in clumps. Several leaves grow from a small disc or "holdfast" about  $\frac{3}{8}$ " in diameter which is firmly attached to the rock. Each leaf is narrow and flattened, and branches again and again so that the whole plant forms a clump. The leaves are about 2 to 6 inches long in our waters, and vary greatly in width and in the frequency with which they branch. They may be fresh and stiff or stringy and tough. The clumps may be dense or loose. The leaves never bear bladders as do those of rockweed or bladderwrack which sometimes grows with Irish moss.

The colour of living moss varies from dark red-brown to light green and is usually darker near the bases of the leaves. In various stages of rotting the moss may be pink, creamy or almost pure white. When dried without rotting it is very dark red-brown.

When bleached commercially the colour becomes lighter until it reaches a light straw colour.

Irish moss varies so much in colour and shape that it is very difficult to describe it clearly enough to enable the inexperienced to recognize it with certainty. Samples will be identified free of charge if sent to the Atlantic Biological Station, St. Andrews, N. B.

### Where it grows

Irish moss is found on rock bottom but never on sand or mud except when washed there by storms. It grows commonly in exposed situations and when found in sheltered inlets is often so dirty with silt and fine growths as to be of little value.

Irish moss grows from near low-tide level to a depth of at least 15 ft. in some places. Its occurrence farther down is little known as that is about the greatest depth from which it can be taken profitably by any method yet developed.

### What areas have commercially valuable quantities

Irish moss occurs from New Jersey to Newfoundland and it is present in small quantities almost everywhere on our coast. Only in certain areas is it abundant enough to be commercially valuable. Our industry will be able to compete only where there is enough Irish moss, relatively free from silt and from other seaweeds, to make gathering cheap. Present prices make it worth 1c to 2c a pound as it is landed on the beach but these prices are likely to fall. To make the industry profitable it must be possible for one man to collect several hundred pounds daily.

The Fisheries Research Board of Canada, in co-operation with the governments of Nova Scotia, Prince Edward Island and New Brunswick, has conducted some exploration for Irish moss. This, combined with the experience of the industry, gives a reliable picture of the general distribution but abundance varies from year to year and the details of the producing grounds in each area can be found only by experience.

In the Bay of Fundy there are small quantities everywhere but Irish moss has nowhere been found abundant enough to be commercially valuable.

On the outer coast of Nova Scotia moss is present everywhere and its abundance increases from east to west, with good producing areas in Yarmouth county. The moss seems to occur much in exposed situations on the western part of this

coast and in such places is freer of silt and of other seaweeds than in the sheltered bays. Although the areas to the west are more productive, Irish moss is apparently sufficiently abundant locally to the east to make collection profitable.

In the southern part of the **Gulf of St. Lawrence** Irish moss is abundant over wide areas. It is present in good commercial quantities on all sides of Prince Edward Island and on the mainland from the Gut of Canso to Malagash and from Richibucto to Point Escuminac. From Pugwash to Buctouche no great abundance has been found. Some is present on the west coast of Cape Breton which has not yet been well explored and has not produced any considerable quantities commercially. Some is also present about the Bay of Chaleur and on the Gaspé coast, but there has been no considerable commercial production north of the Miramichi estuary and its distribution in the northern part of the Gulf of St. Lawrence is not well known.

There are local differences in quality which are not clearly understood. The moss differs in colour and size and apparently also in the quantity and qualities of the gelose. These local differences may affect the industry, but to date clean, well-cured moss has always been salable with little variation in price from place to place.

#### Seasonal growth

Spores are produced during the summer and autumn and settle and grow into new plants. Some persist over winter but large quantities are torn loose and cast ashore by storms in the late summer and autumn. Growth is rapid in the early summer and the crop is never at its best until mid-summer or later. Young, lighter-green, rapidly-growing moss is more easily cured than old, tough, dark moss and the gelose produced from the young moss is of higher quality. In our waters both the quantity and the quality are usually best in July and August, although collection may be continued profitably for a much longer season.

Late in the summer "rust" is more abundant. It is caused by an animal which has a free-swimming stage which settles on the moss and multiplies there. Each microscopic animal secretes a limy shell so that a thin white covering occurs over spots on the moss. It causes deterioration, reduces the yield of gelose and contributes useless weight.

#### Growth of the Industry in the Maritime Provinces

For many years before 1941 Irish moss had been collected, dried and bleached by a few men in the vicinity of Havre Boucher, Antigonish county, N. S., who had learned the trade from Scituate, Mass. Their annual production was about 10,000 lb. dried and prices were generally less than 10c per lb. for well-cured moss of good quality. In 1941 this price was almost doubled and the export price for high-grade bleached moss has not since fallen much below 20c per lb., with, of course, much lower prices for "black" moss (dried but not bleached). The shipments since 1941 have been about as follows in terms of dried moss. The figures are railway company records of shipments in carload lots only and considerable additional quantities are shipped in smaller lots. There is, furthermore, no accurate re-

cord of the carry-over from collection in one year to shipment in the next year, but the general picture would not be affected.

#### Approximate annual carload shipments of Irish moss (pounds)

	P. E. I.	N. S.	N. B.	Total
1946	2,354,000	528,000	0	2,882,000
1945	665,979	513,000	0	1,179,000
1944	773,248	488,611	26,000	1,288,000
1943	722,000	155,000	0	877,000
1942	1,490,000	490,000	26,000	2,006,000
1941	208,000	53,000	0	261,000
1940	0	ca. 10,000	0	ca. 10,000

With a good price and a demand in excess of the supply, the volume of production increased very rapidly from about 10,000 lb. in 1940 to about 2,000,000 lb. in 1942. The reduction in 1943 was due partly to unfavourable weather and labour shortage but also partly to less active demand. The large purchases in 1942 and increased production in New England made United States buyers less anxious to purchase supplies in the Maritime provinces and better able to refuse moss of poor quality. High-grade moss remained salable without reduction in price but large quantities of low-grade moss were not accepted by the market. The need for high quality was already in evidence. As expected, the production increased in 1944. In 1945 lateness in the crop (possibly due to dark weather in the spring) was discouraging but the total production was almost the same. In 1946 it increased greatly. Large supplies were available and the increasing demand more than compensated for the fact that some moss was again available from Europe.

#### Future of the Industry

Before the war this continent imported Irish moss from Europe at prices less than half those now prevailing. This may well be possible again after the war. The war has also made similar products from other seaweeds (such as Japanese agar) scarce, and Irish moss has been used to quite an extent to replace these and even to replace some gums from other sources than seaweeds. For some purposes the gelose from Irish moss is superior to other similar products but in many of its uses it can compete only if cheaper than its competitors. In the post-war period, therefore, it will be necessary for Canadian Irish moss to compete not only with production in other countries but also with better supplies of gums from other seaweeds or from entirely different sources. Present prices for Irish moss in the Maritime provinces may have to be reduced considerably and high quality will be necessary.

If a real effort is made to improve both quality and the efficiency of production, our industry will probably be able to survive and grow, even against such competition. The use of products of this type is increasing and it is well worth while making a real attempt to keep a place in this field.

The natural production varies from year to year but we have never yet harvested a very large production of the available crop, some localities being untouched and others depending to date almost entirely on moss cast up by storms.

### What is wanted in Irish moss

The uses of Irish moss are too numerous to list here and new uses are constantly being found. They all depend on certain qualities of the "gelose" which can be extracted from the cured moss. This "gelose" is a complicated carbohydrate which has certain abilities on which its value depends. When very small quantities are added to mixtures, such as chocolate milk, it "stabilizes" them by acting as a suspending agent and preventing the particles from settling out. Small quantities (2% or even less) can produce jellies or can make liquids thick or "viscous". Another important property is that small quantities make it easier to make emulsions, for example, make an oil break up into such small drops in water that a smooth, milky fluid results. In general it is used by adding small quantities to other substances in order to change or to preserve their consistency.

Without attempting to give a complete list of uses, some examples might be of interest. One of the commonest is in chocolate milk. It is used in meat and poultry canning as a jelling agent to keep the contents from becoming mushy. It is used in the mixing of water-soluble paints. It has also many uses in the preparation of cosmetics and medicines. It is used in leather dressings, shoe polishes and in the preparation of the jellies on which bacteria are grown. It has been used as a size for cloth and as a thickener for colours in calico printing. It is used in candy and in milk puddings, although its nutritive value is low. It is used in the clearing of beer.

This gelose, for which the moss is valuable, is usually extracted commercially by dissolving it out in fresh water. The moss must be collected and cured in such a manner that as much of the gelose can be extracted as possible and so that it will have the qualities the industry wants. In general, this means that it must be cured before it starts to rot and without having the gelose lost by exposure to too much water or heat. For some industrial uses drying alone is sufficient and for others sun-bleached moss is wanted.

### Methods of Collection

Irish moss may be raked or picked by hand from the rock ledge on which it grows, or may be taken on beaches when cast up by storms. In either case it should be taken as free as possible from other seaweeds or other materials such as small stones, shells, etc., and it should not be collected at all unless really fresh.

When good-quality moss freshly **cast up by storms** can be obtained in large quantities this is the cheapest method of collection. At times fresh moss occurs in windrows immediately after storms, making it possible to take it by the wagon-load and sometimes it can be forked directly from the water. Care must be taken, however, to collect only moss which has just been washed up and is still green and fresh. It should be washed immediately with salt water to remove sand and spread immediately in a thin layer to prevent rotting. Moss which has turned pale or pink on the beach should never be taken and even moss which has dried on the beach to a dark red-brown colour is likely to be inferior in quality to

moss raked from the rocks or collected immediately it is cast up. Buyers should take the cast-up moss, or "beach moss" as it is often called, with care, refusing lots which show signs of deterioration. This is a cheap method of collection which, when used with discrimination, can give a product as good as any but which requires great care if quality is to be maintained.

Although more expensive, **raking** produces a more reliable supply than dependence on storms to cast moss up and usually produces cleaner and fresher moss. A higher proportion of the Maritime province moss will probably be produced by raking in the future.

A typical Irish moss rake has teeth 6 to 8 inches long made from  $\frac{1}{4}$ -inch, square steel tapered towards the outer end. They are set, usually by electric welding, about three-eighths of an inch apart on a steel strap 15 to 18 inches long and about 1 inch wide and three-eighths of an inch thick. The wooden handle is usually 15 to 18 feet long and set at an angle of about 75 degrees to the teeth. The handle is attached to the rake in the same manner as garden rakes by a piece of tapered steel welded to the head of the rake and fitted into a ferrule on the handle. The rake is drawn along the bottom with the teeth almost parallel to the bottom. The stems of the moss slide between the teeth and jam there until pushed out into the dory.

Rakes of different types may be used. In very shallow water, a shorter handle is better and on very rough bottom a narrower rake can be used more easily. Even when the moss is exposed or barely covered at low tide raking is more efficient than picking by hand.

Raking is more effective if the bottom is visible, although it can be done blind if moss is plentiful. A few drops of crude fish oil sprinkled on the water will greatly improve the visibility.

Over 1,000 lb. of fresh moss can be raked by one man in a day on grounds where it is considered plentiful.

### Cleaning

Irish moss should be thoroughly washed when it is landed, using clean salt water. Shells, stones and other seaweeds should be removed as it is collected and those which are missed must be picked out by hand during the curing process. Plants badly covered with "rust" should be removed but there is no method of removing the rust if it is widespread and it will result in reduction in value and, if bad enough, in unsalability of the product.

### Used in Food and must be kept Clean

Much Irish moss is used in food products and it is of the utmost importance that it be kept free from filth of all kinds. It must not be dried in barn-yards, on roads or anywhere where it is exposed to animals. Only clean water must be used for washing and bleaching. Equipment such as drying floors, etc., must be kept clean. Unless cleanliness is strictly observed there is constant danger of shipments being condemned by health authorities with consequent loss to the shipper and damage to the reputation and market prospects of Canadian moss as a whole.

**Dry immediately**

Irish moss starts to rot in a few hours when kept warm and damp, and loses the qualities for which it is valuable. It should be spread thinly immediately after it is landed, especially if the weather is warm, and should be dried as quickly as possible.

**Drying**

To dry Irish moss, spread it in a single layer on clean surfaces in as dry and windy weather as possible and cover at night or in damp weather.

Moss is sometimes dried on sand, on canvas, on grass, on wire netting or on concrete, but board surfaces are recommended as combining cleanliness with low cost. Drying on grass or sand makes moss dirty. Drying on wire is clean and slightly more rapid than on boards but small pieces of moss are lost. Concrete has no advantage over boards and is more expensive.

Partially dried moss will take up moisture if left exposed to dew or in damp weather. It should, therefore, be covered at night or in foggy weather.

If moss is spread more thickly than in a single layer the time of drying is increased proportionately and there is greater danger of part of the moss being incompletely dried. Under the best conditions (high temperature, dry air and wind) moss has been dried to a moisture content of only 10% in as little as 16 hours and one or two days are ordinarily enough to dry moss for the market. It should not contain more than 15 to 18% moisture and should feel dry and crisp to the hand.

**Bleaching**

Sun bleaching improves the "stabilizing" power of moss and its usefulness for a number of purposes. It may sometimes be marketed dried but not bleached, but its value is usually increased by about 8c to 10c per lb. at present prices by bleaching thoroughly, and correspondingly less by partial bleaching.

To bleach it, spread moss in a single layer on clean surfaces in the sun, keep it wet to the touch, preferably with salt water, turn it frequently and cover at night or when it rains. Under the best conditions it may be bleached in a day but even with the best methods two or three sunny days may be necessary, or considerably more in the late autumn or in dull, cool weather. The leaves bleach more rapidly than the stems, and young, green moss much more rapidly than old, dark moss.

If moss is dried to have a moisture content of less than 40% bleaching slows down and is almost stopped when the moss is dry. At a moisture content of 40% it feels wet.

Ordinarily moss is dried immediately for transport and storage until it can be bleached under good conditions but a preliminary drying is unnecessary and moss may be bleached equally well immediately on landing.

Salt water should be used for moistening, although fresh water does little damage in the early stages if not used in excess. Too much fresh water will leach out the gel and damage by fresh water in-

creases as bleaching progresses. Salt water down to a strength about two-thirds of that of sea water will not leach out the gel.

Moss should not be exposed to excessive heat when damp as this results in the gel coming out of the leaves and matting them together.

For bleaching, solid surfaces such as board or concrete are better than wire, possibly because they retain heat and reflect light. Bleaching is more rapid if the surface is tilted towards the sun.

All the moss must be exposed to the sun. It should, therefore, be spread thinly and turned frequently. If spread thickly some leaves will not be properly exposed and bleaching will not be uniform.

**Shrinkage**

The weight of fresh moss necessary to produce one pound of cured moss varies somewhat with the conditions under which curing is done and with the nature of the moss itself. When curing is slow shrinkage is likely to be large. On the average it takes about 4 lb. of freshly-landed but drained moss to produce 1 lb. of dried but not bleached, and about 5 lb. of fresh moss to produce 1 lb. of bleached.

**Curing Establishment**

Both the efficiency of curing and the quality of the product can be improved greatly by proper equipment and care. The best results are to be expected when the moss is cured by an individual or group making it their special business. The equipment is simple and consists of floor space, a supply of clean, salt water, a means of covering the moss at night or in wet weather and storage space. The establishment should be convenient both to a supply of fresh moss and to a means of shipment. Good weather is important. Much fog may often be avoided by moving a very few miles.

The floor space necessary will depend on the output expected and will limit it. It may be estimated at about 2 sq. ft. per pound of dried moss produced at a time. The turnover will, of course, depend on weather. In the Maritime provinces a maximum would be 2 to 3 lots per week for bleaching and drying, or 3 to 6 for drying alone.

**Storage**

If moss is damp it will mould. The maximum moisture content to be safe from mould appears to be about 28% at which moss feels dry but somewhat softer than when thoroughly dry.

The trade prefers moss with a moisture content of about 18% or less and this appears to be about the greatest degree of dryness at which moss could be stored in an unheated building in the Maritime provinces. Its dryness depends on the humidity of the atmosphere in which it is stored, and in heated buildings or drier climates it will remain drier.

For best results Irish moss should be stored at temperatures less than 80° F. and in dry atmospheres. Under these circumstances it may be stored for considerable periods and is, in fact, sometimes used satisfactorily after storage for a year or more. There is still, however, some difference of opinion among users, and long storage should be avoided unless by agreement with the buyers.

**Packing and Shipping**

Irish moss is commonly shipped from the Maritime provinces dried, or dried and bleached. It must be compressed into bales to occupy less shipping space and qualify for reasonable freight rates. Bales of about 100 to 150 lb. are desirable. They must be covered to avoid the loss from open bales. When available, burlap was commonly used but any covering is satisfactory if strong enough.

Much shipping space would be saved by grinding and shipping in bags. This is recommended for shipment within the country if satisfactory to the buyer. Ground moss is now subject to duty on entering the United States while whole moss enters duty-free.

**Marketing**

Marketing can be carried on to better advantage by a few responsible agencies than by a large number of small producers. Marketing by many small producers leads to confusion, lack of uniformity and lack of confidence of buyers in Canadian shippers as a whole. It is in the interests of small producers themselves as well as of the industry as a whole to ship through a few agencies whether private firms or co-operatives.

Quality is all-important in marketing and must be maintained. All moss must be properly cured and

free from impurities. It varies so much, however, and is required for so many different purposes that samples must be used in negotiating sales. It is then important to keep subsequent shipments to the standard of the samples.

**Inspection**

It has been proposed that inspection be introduced when possible to assure the buyer of certain minimum standards of quality. With reasonable care all producers need ship no moss with a higher moisture content than 18% or with more foreign material (sand, shells, other seaweeds, etc.) than a small percentage by weight, possibly 2%. There should be no filthy foreign material whatever. To ship moss of poorer quality damages the reputation of Canadian moss as a whole and shipments of such should only be permitted if the material is labelled to indicate that it is sub-standard.

Grading supported by government inspection may eventually be needed as an aid to marketing but the establishment of uniform standards does not seem possible without more knowledge and experience. We need to know more of the qualities required for various purposes and the means of producing those qualities and measuring them. On the other hand, grading by shippers to meet the requirements of buyers is highly desirable and is now being carried on with good results in some instances.

